

What is Animal Behavior?

How to study Animal Behavior?

Scientific methods

Observe behaviors



Questions



Hypotheses (>2)



Predictions (If....then...)



Test hypotheses (experiments)



Approve or falsify hypotheses

Observe behavior



Questions



Hypotheses (>2)



Predictions (If....then...)



Test hypotheses (experiments)



Approve or falsify hypotheses

What questions do you come up with?

“Why”
question

Ultimate
cause

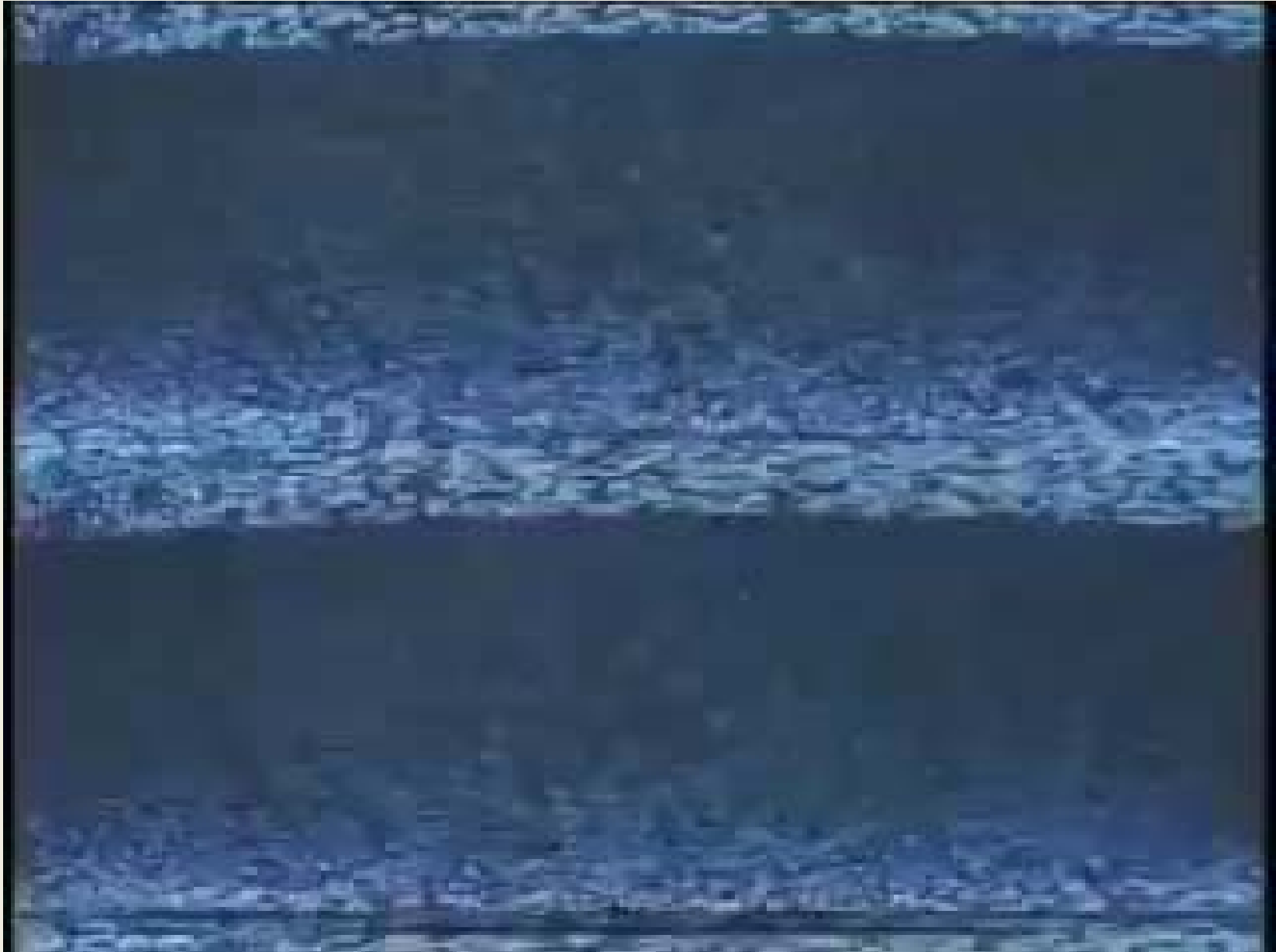
Evolutionary
adaptation/
Function

“How”
question

Proximate
cause

Genetic, hormonal,
or neural
mechanisms/
Development

Behavior of the green heron



What questions do you come up with?

“Why”
question

Ultimate
cause

Evolutionary
adaptation/
Function

“How”
question

Proximate
cause

Genetic, hormonal,
or neural
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Observe behavior



Questions



Hypotheses (>2)



Predictions (If....then...)



Test hypotheses (experimental design)



Approve or falsify hypotheses

Hypothesis

1. Testable
2. Alternative hypotheses
3. Assumption: Natural Selection

Hypotheses proposed are based on the assumption of behavior is evolved through natural selection.

Natural Selection of behavior

1. Individual variation in behavior
2. Behavioral trait is inheritable
3. Differential reproduction to select individual's behavior.

Case study: Birdsong



Winter wren



Nightingale

The earth has music for those who listen
~ *William Shakespeare*

What questions do you come up with?

“Why”
question

Ultimate
cause

Evolutionary
adaptation/
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or neural
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Why do birds sing?

“Why”
question

Ultimate
cause

Evolutionary
adaptation/
Function

Birds sing to :
Attract females/
Defend territory

How to test the function of singing?
muting!



How do birds sing?

“How”
question

Proximate
cause

Genetic, hormonal,
or neural
mechanisms/
Development

How do birds sing?

(proximate cause)

1. Neural mechanism

Specialized brain pathways for singing

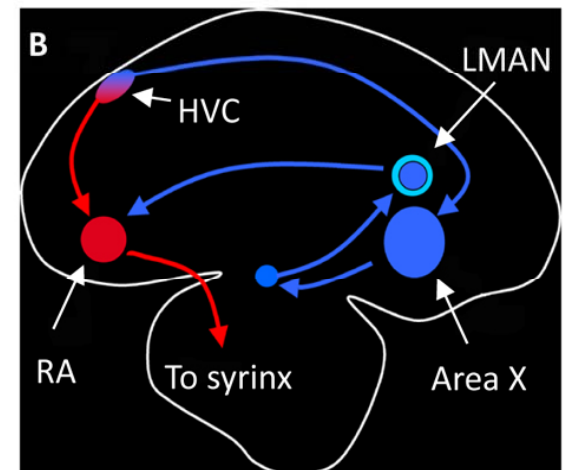
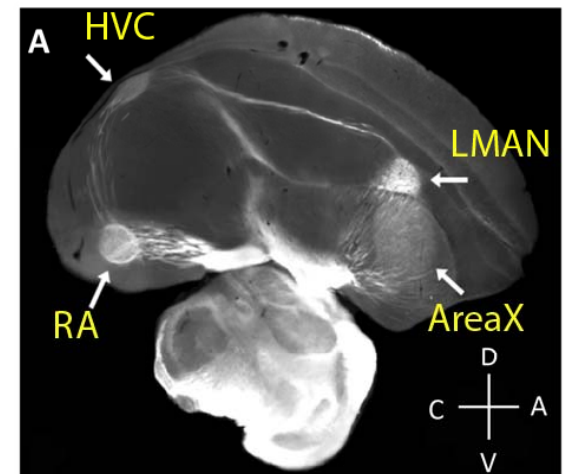


Figure 1. (A) Dark field image of a brain section (sagittal) through several song nuclei. (B) Circuit diagram of song system.

How do birds sing?

(proximate cause)

2. Molecular mechanism

Singing induces gene expression (*ZENK*)

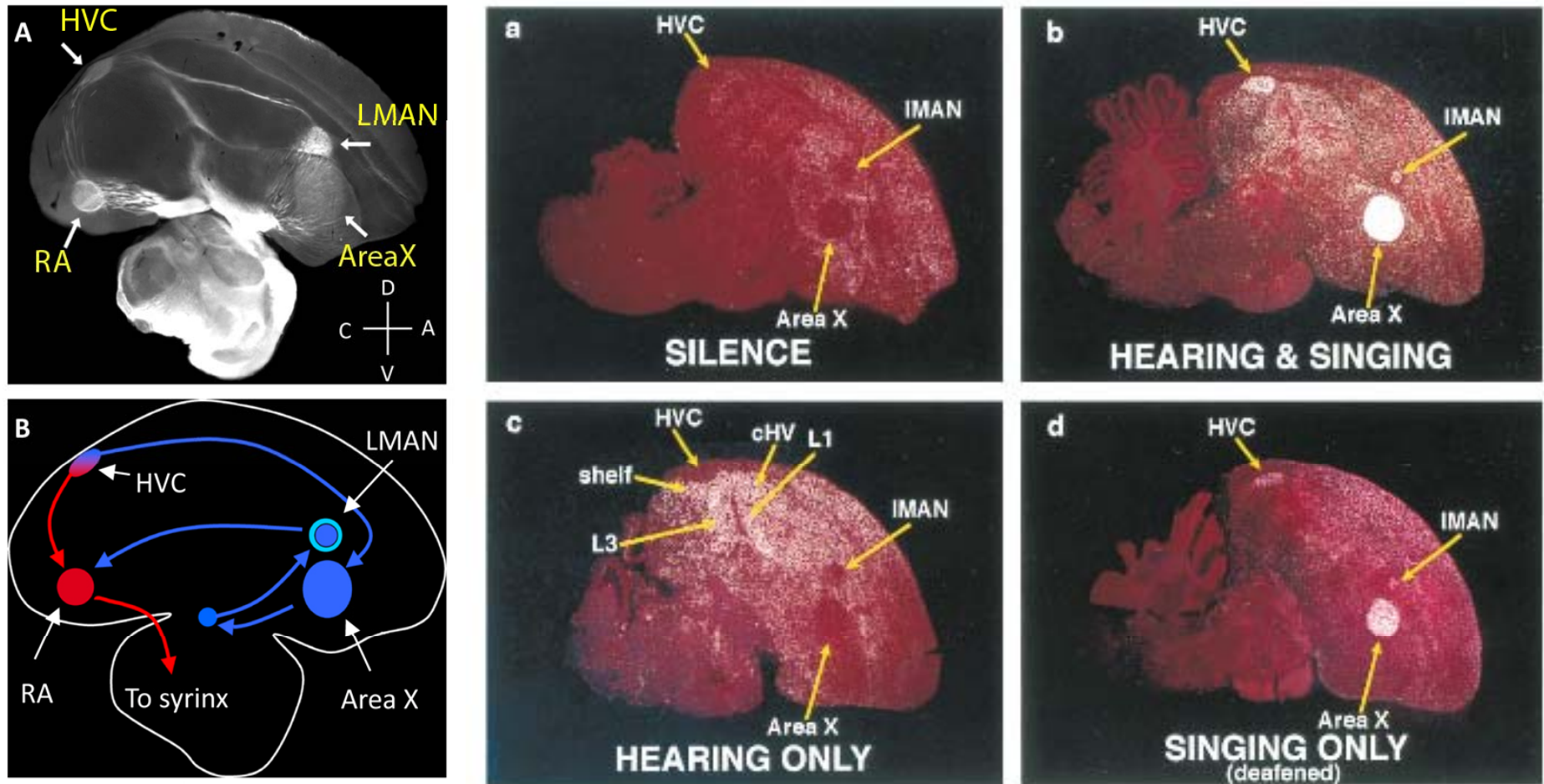


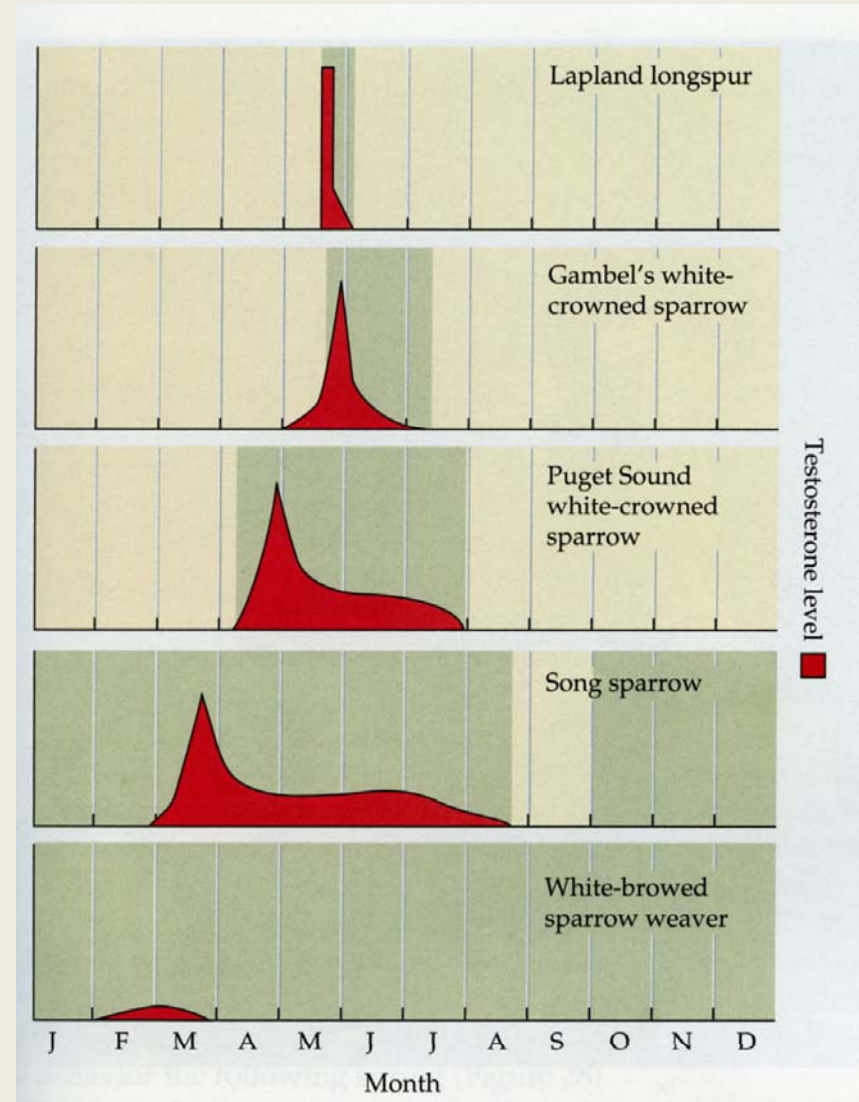
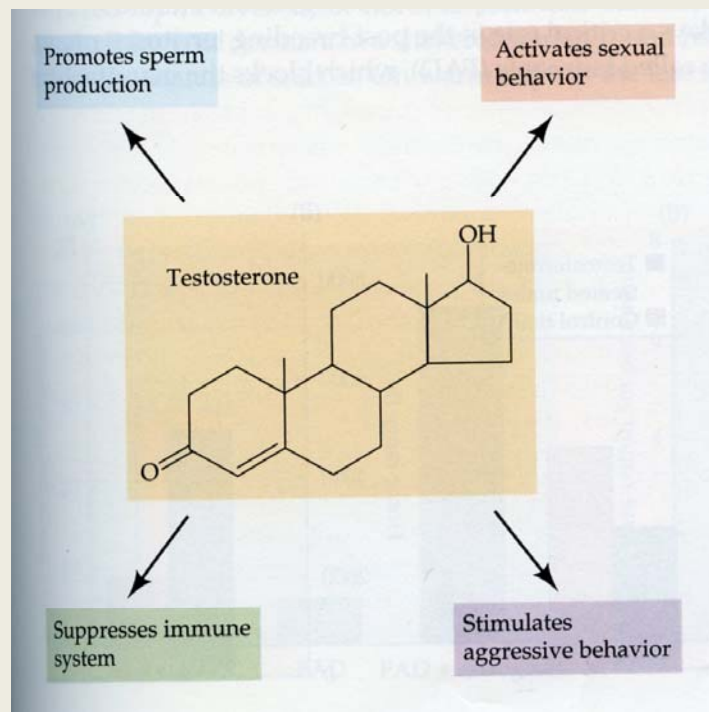
Figure 1. (A) Dark field image of a brain section (sagittal) through several song nuclei. (B) Circuit diagram of song system.

How do birds sing?

(proximate cause)

3. Hormonal mechanism

Testosterone and singing behavior



Quiz #1



Wing-flipping of *Automeris* moth

Proximate causes or Ultimate causes?

1. How do the moth's muscles make its wings move, and what controls those muscles?
2. What do moths gain by wing-flipping?
3. Has this behavior changed over evolutionary time?
4. Did the foods the moth ate as a caterpillar influence how it behaves as an adult?
5. Did the moth inherit this behavior from its mother/father?